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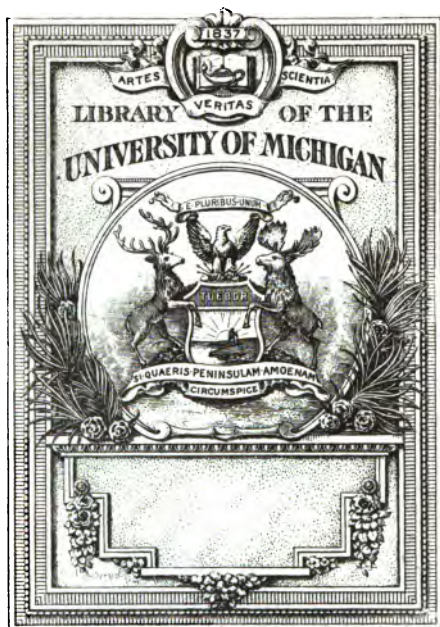
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1904

National Paint works
a second review of
Technical paints

Univ. of Mich.



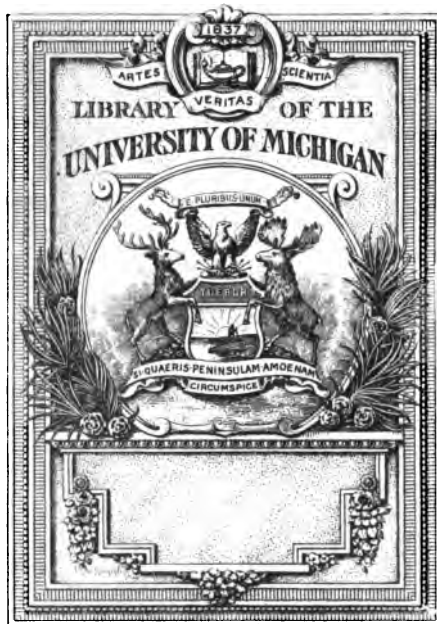
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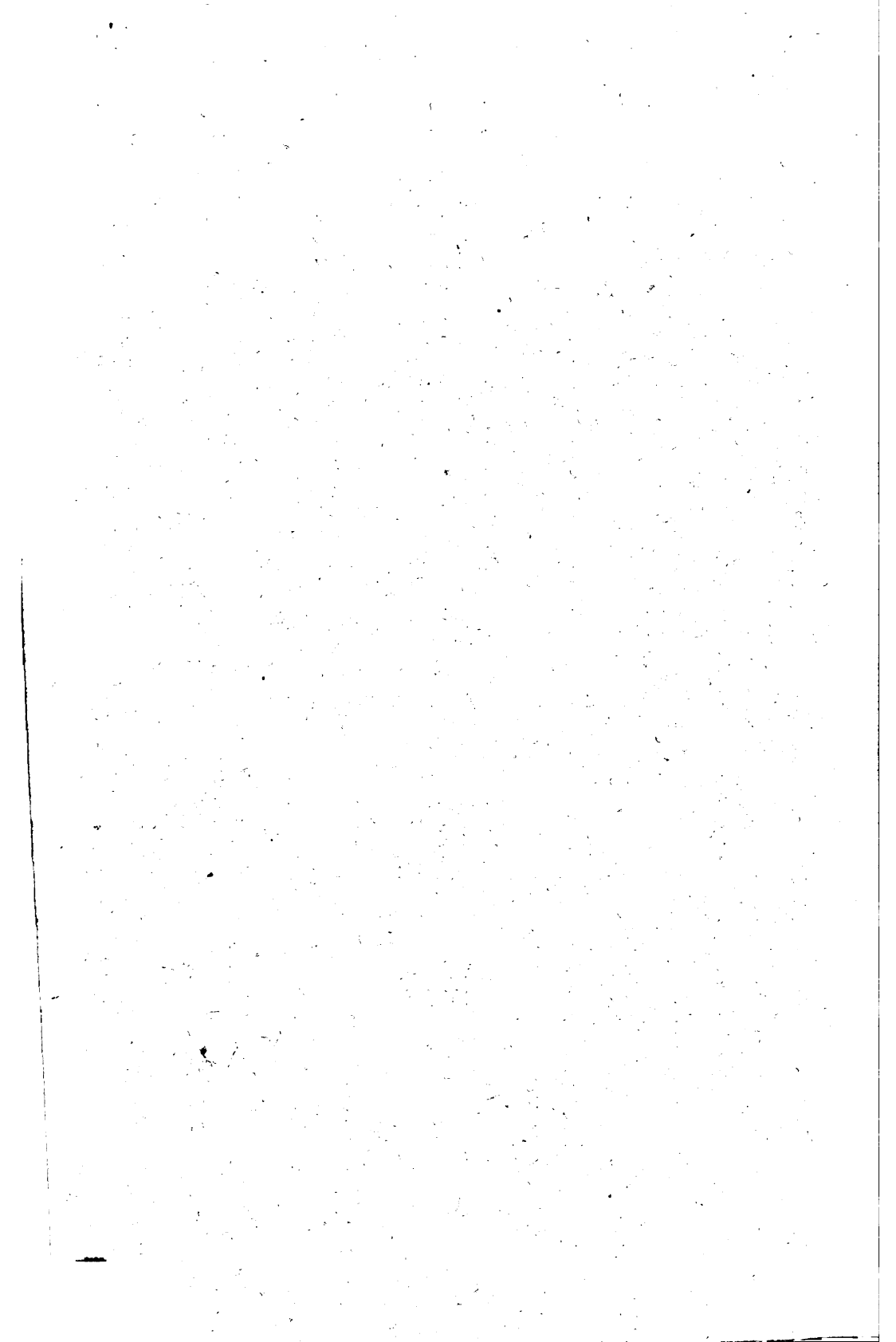
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1904



1904 EDITION

A
**Second
Review**
OF
**Technical-
Paints**
FOR THE
Protection
OF
**Metal
Surfaces**



A Second Review of Technical Paints for the Protection of Metal Surfaces

124818

BY
FRANK P. CHEESMAN
OF THE
NATIONAL PAINT WORKS
Specialists in Paints for Metal Surfaces
WILLIAMSPORT, PA.

CHICAGO

NEW YORK



W. G. ELLIOT



F. P. CHEESMAN

1874—1904

This business was founded in 1874 by William G. Elliot. In 1882 he took in as partner William H. Loomis, who had been with him since 1878 as a salesman, and this partnership continued until 1903, when Frank P. Cheesman, who had been identified with two leading houses in the Paint trade for over twenty years, bought out the interest of Mr. Loomis, Norman Elliot, son of W. G. Elliot, still continuing in charge of the manufacturing department, which position he has filled for a number of years; and since the change in May, 1903, the capacity of the plant has been enlarged over 50 per cent., many improvements and new connections having been made, and a Purchasing and Sales Office opened in New York, as well as a Sales Office in Chicago.

Copyright, 1904
By
FRANK P. CHEESMAN

PREFACE.

The National Paint Works are unique in the position they occupy in the Paint Trade. For thirty years they have been the only Paint Manufacturers of any size who have confined their dealings to the large Consuming and Corporation trade. We claim that a Manufacturer cannot sell Dealer and Consumer and do justice to both. The Dealer, however, has no complaint against us, because we have not solicited his business, hence we have a right to sell the Consumer direct, but in doing this we are not injuring the Dealer, as the Consumers we sell are large ones, and must buy direct from the maker. But the Manufacturer who tries to sell Dealer and Consumer must protect the Dealer to a certain extent, hence he is not in a proper position to do the large Consuming buyer justice.

We are the Pioneer Manufacturers of "Special and Technical Paints for Metal Surfaces," and have supplied more Paint for Metal than all the other Paint Manufacturers combined, and yet we must confess we do not know it all, and if you know of anything better, send us your specifications and we will give you just what you ask for.

We use the best skill we can obtain to secure the proper production of our goods, but the best is but human and will at times make mistakes, and as we are not above making mistakes neither are we above correcting them. We do not allow knowingly a single gallon of paint to leave our works that is not up to its proper standard. If, however, the goods are not what you think they should be, notify us at once, and your complaint will be promptly investigated and the matter adjusted to your satisfaction.

We thank you for your past favors, and will do all in our power to warrant a continuance of your orders.

NATIONAL PAINT WORKS.

Williamsport, Pa.
March 1st, 1904.

CAUTION.

Several concerns have started in business within the past few years under the name of NATIONAL, and some of them have attempted to trade on our reputation. We desire to caution our readers, if they want the best goods from the Original Pioneer Manufacturers, to specify NATIONAL PAINT WORKS OF WILLIAMSPORT, PA.

A

**SECOND REVIEW OF
TECHNICAL PAINTS FOR THE PROTECTION
OF METAL SURFACES.**

Three years have passed since our last Review was issued and during that time we have gleaned some new facts from experience. The Paint Market now, as then, continues to be flooded with new mysterious products under queer, fantastic names, but the old time standards have more than held their own, and as Louis E. Andés says (page 58, Iron Corrosion) :

"The use of an oil paint, made from good material, properly laid on and renewed in good time, is still the best means available for painting iron structures. Moreover, the author is convinced that this will long continue to be the case, for he cannot conceive any other coating endowed with the same qualities, and so easy both to apply and renew."

While we propose to continue testing everything new that is offered as an improvement on the old, we will not advocate the use of a new pigment or vehicle until we have tested it under all possible conditions.

A working test is the only reliable test. Laboratory and short time tests are frequently very misleading, and we can give many instances to prove this.

The pigments which are recognized generally as being the standards for use on Metal Surfaces, either separately, or in combination, are as follows :

Red Oxide of Iron.

Brown Oxide of Iron.

Carbon.

Red Lead.

Blue Lead.

Graphite.

Asphaltum.

White Lead sublimed or corroded.

In vehicles, Linseed Oil, Turpentine, Varnishes and Driers, are the best used for grinding, thinning and drying purposes.

All of the above pigments and vehicles have their value and use, but it takes experience, care and skill to make a satisfactory protective coating out of them.

WHICH IS THE BEST PAINT?

In 1897 we painted a number of iron plates 10 x 12 with eight of the then leading paints on the market. Each plate was coated with three coats, and exposed continuously to the weather on the roof of our factory at Williamsport, from July, 1897, to July, 1903, and we now have them on exhibition at our New York City office. Their order of merit as regards durability is as follows:

- No. 1, National Paint Works, No. 31, English Red Oxide of Iron.
- No. 2, National Paint Works, No. 17, American Brown Oxide of Iron.
- No. 3, National Paint Works, No. 16, Carbon and Asphaltum Black.
- No. 4, National Paint Works, No. 400, Pure Carbon Black.
- No. 5, National Paint Works, No. 700, Red Lead and Graphite.
- No. 6, National Paint Works, No. 32, Graphite.
- No. 7, Manufacturer's name given on personal application—Coating.
- No. 8, Manufacturer's name given on personal application—Metal Protective.

We have also on exhibition, plates finished with both Red Lead and Blue Lead, showing their relative merits for first coating, and the Blue Lead seems to stand as well, if not better than the Red Lead, while there is an economy as regards labor and material in the use of Blue Lead, as compared with Red Lead for first coating.

In 1898 The Osborne Co., civil engineers, Cleveland, Ohio, made a most careful test of some twenty-five different kinds of paints, pigments, vehicles, varnishes, etc. They painted some 250 different metal plates, and made five different exposures that lasted from three to sixteen months viz.: Brine, Acid Fumes, Weather (with plates placed flat and upright), Depot (that is, hung in the Union Depot train shed over where the locomotives stand, and in such manner that the plates would receive their great blasts when they start). A careful inspection of the Osborne blue print report shows that the oxide pigments are the best, as an oxide of iron is marked perfect on four exposures, and good on the fifth or acid exposure. All tests were two and three coats of paints.

In November, 1897, Mr. Ira O. Baker, Professor of Civil Engineering, University of Illinois, in conjunction with one of his students, Mr. F. W. Von Oven, made tests of twelve different kinds or makes of paints. Mr. Von Oven presented his thesis the following June, with a table of tests that had been rushed through the laboratory, consisting of the following: Heat, salt water, sulphurous acid gas and relative elasticity. This was published in the "Railroad Gazette" of March 10, 1899.

His table of short time tests, as published at that time, shows conclusively that the Asphalt paint was much the best, as proven by five laboratory tests, as in four of them it stood No. 1, and in the fifth (the salt water test), No. 2. He also made a long time weather test of the twelve paints received. After a weather exposure of two years and eleven months, they were examined on November 20th, 1900. The Red Lead and National Paint Works, No. 17, Brown Oxide of Iron showed no rust spots on either the first or second coats, while all the others showed rust badly, and especially the Asphalt paint.

This proves conclusively that the long time weather tests are the only tests of any value, and that the laboratory and other short time severe tests are very misleading.

Mr. Hunter MacDonald, Chief Engineer of the Nashville, Chattanooga and St. Louis R. R. in a paper which he read in 1899 before the Engineering Association of the South, entitled "Painting Railroad Bridges" states as follows: "As painting is the only remedy so far in use against oxidation of bridges, the question of what paint to use is an ever-recurring one to the officer in charge of construction and maintenance.

The writer recently undertook a laboratory test of twenty different

kinds of paint, which will be briefly described, but he is free to confess that the laboratory test is a short cut, and is not entirely conclusive on account of the impossibility of bringing to bear all the destroying agencies which are to be encountered in practice.

Twenty discs of No. 22 sheet iron, six inches in diameter, were placed on a concave wooden block and hammered with a round-faced hammer until each became a saucer about half an inch deep. The inner surface of each saucer was divided by radial lines into three equal sectors. After being thoroughly cleaned one-third of each saucer received one, two, and three coats, respectively.

Each saucer had about a tablespoonful of locomotive sparks placed in it and water poured over them until about three-quarters full. They were then set away. This was done on June 1st, 1899. The saucers were watched, and as each became dry it was refilled. On November 1st, 1899 the saucers were submitted to one of our members for classification with regard to the rust-resisting qualities of the paints. After careful examination he arranged them in a row in the order of their superiority, and then called in another member, who, on looking over them, approved his classification. Neither one knew the name or kind of paint used. These saucers are presented for inspection.

The writer, equally ignorant, also made a classification, marking each third of each saucer whatever percentage of 100 his best judgment dictated.

A comparison of the two results is given below.

COMPARISON OF CLASSIFICATION.

No. of Samp.	Rank by member.	Rank by Writer.	Kind of Paint.
1	9th	6th	Dixon's Silica Graphite Ground in Oil.
2	11th	10th	**
3	7th	8th	**
4	17th	8th	Allen's Antirust Japan.
5	2nd	2nd	Penn. Standard Rubber Paint.
6	3rd	3rd	Red Lead and Oil.
7	14th	9th	Lampblack.
8	5th	4th	National Paint Works, No. 800-B.
9	15th	10th	Mexican Graphite.
10	13th	11th	Ferrubron.
11	19th	12th	**
12	4th	5th	**
13	10th	10th	**
14	1st	1st	[Protector.
15	16th	9th	National Paint Works, No. 500 Metal
16	20th	13th	Princes Mineral Brown.
17	8th	6th	Princes Red Oxide.
18	6th	7th	National Paint Works, No. 31, Special.
19	18th	9th	Nat. Paint Works, No. 32, Graphite.
20	12th	10th	National Paint Works, No. 700-B.
			American Lucol Co. Durax.

**Proprietors do not desire publication of tests.

The importance of selecting a good paint is emphasized by the fact that the cost of its application is from three to five times the cost of the paint, depending upon the character of the structure to be painted and the condition the iron happens to be in when the application is made. The cost of the paint is a small item, compared to the labor of its application."

Of course we are pleased that our No. 500 Metal Protector was selected unanimously as being the best paint tested, and the test proves conclusively what we have always claimed for it, that for the under side of bridges, and for all hydraulic and underground construction, No. 500 is an ideal paint, but it will not stand as well as our No. 16 or No. 400 on the upper part of bridges where it also has sun exposure.

THE NIAGARA FALLS POWER COMPANY,
Buffalo Avenue.

Niagara Falls, N. Y., January 15, 1904.

National Paint Works, Williamsport, Pa.

Gentlemen: During the past two years we have been conducting a series of experiments to determine the qualities of various paints manufactured for the protection of iron and steel surfaces. These experiments consisted of three series, as follows:

- (1) Evaporation test;
- (2) Wet and dry test;
- (3) Sulphur test.

(1). The evaporation test was conducted as follows:

Untinned steel pie pans, 9 inches in diameter and $\frac{3}{4}$ inches deep, were painted two coats, sufficient time being given for one coat to dry before the second coat was applied. When the second coat was thoroughly dried the pans were filled with water which was then allowed to evaporate. During the winter months this evaporation took place over boilers, while during the summer the water was evaporated more slowly as the boilers were not in operation. The pans were first filled on February 7, 1902, and up to January 1, 1904, have been filled and the water evaporated 45 times. Upon examination on January 1, 1904, the paints of your manufacture showed the following percentage of fully protected surface, a perfectly protected pan being rated at 100%, namely:

Red Lead and Graphite No. 700.....	99%
Metal Protector No. 500.....	75%
Carbon and Asphalt No. 16.....	60%
First coat No. 700; second coat No. 500.....	100%
First coat No. 700; second coat No. 16.....	99%

(2). In conducting the wet and dry test, strips of No. 20 black iron $\frac{3}{8}$ inches by 15 inches were first given an edging coat, and then two complete coats of each paint under test. The strips were then held vertically in a frame which was alternately lowered into a tank of water and placed in the air. This alternate wetting and drying took place at least four times per week, commencing about February 7, 1902. On January 1, 1904, an examination of the several strips showed the following results for your paints, namely:

No. 700.....	99%
No. 500.....	65%
No. 16.....	95%
First coat No. 700; second coat No. 500.....	95%
First coat No. 700; second coat No. 16.....	90%

(3). The sulphur test was conducted as follows:

Strips of the same size as those employed for the wet and dry test were placed in a frame which was immersed for three-fourths of its height in a tank filled with water impregnated with sulphur, such water being obtained from a fissure in the rock at the site of our wheelpit. This was a practical test inasmuch as the steel work in the wheelpit is subjected to the action of such water.

As the water evaporated, fresh water was put into the tank. The mixture thus became strong with age. This test was a very trying one and caused most of the paints which were used to blister badly even though the paint was not entirely removed. This test has continued since February 7, 1902, and on January 1, 1904, the strips coated with your paints showed the following results:

No. 700.....	98%
No. 500.....	99%
No. 16.....	99%
First coat No. 700; second coat No. 500.....	99%
First coat No. 700; second coat No. 16.....	100%

No record is made in the above test of the amount of blistering which has taken place, as it would be somewhat difficult to express this in terms of percentage. All the samples have been blistered to a considerable extent, but in the case of the paints above mentioned the surface of the iron beneath is apparently well protected from rust.

Yours very truly,

A. H. VAN CLEVE,
Assistant Engineer.

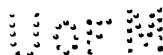
This is a splendid long time test under the conditions it would naturally meet with when used in a power plant like that at Niagara Falls. It shows conclusively that our Red Lead and Graphite Paint No. 700—see page 27—is an ideal paint for such work, and we might add the Niagara Falls Power Co. have bought a great many barrels of No. 700, and it can be inspected there at almost any time.

VEHICLES AND PIGMENTS.

There is quite a difference of opinion as to whether to the oil or the pigment is due the life of the paint. In our opinion to neither one can be given the entire credit, but the life or durability of the paint is due to a proper combination of the two, or in other words, to quote a well known writer, "The solids are co-efficient with the liquids in producing the best material and the secret lies in the proper adjustment of the amount and kind of each requisite to the proper securing of a perfect compound." No amount of theoretical knowledge can determine questions of this kind, but it takes the practical experience of years in the actual manufacturing of goods, and also the proper use of them, to obtain the best results. The manufacturer should also know the conditions under which his paint is to be used, otherwise perfect results under some conditions will prove a failure under others. He should know whether it is to be applied under a high or low temperature, whether it will be a rush job, or whether proper time will be allowed between coats, will skilled workmen be employed or poor ones, and how many coats are to be applied. In solving these questions, you can see how much more valuable service can be rendered by a manufacturer like the National Paint Works, who make up the paint specially for each order so as to be suitable for these different requirements. This is where our success as regards durability has mainly been derived from.

The oil vehicle used is, or should be, raw linseed oil. In making protective paint for metals too little attention is given by some to securing the proper vehicle in which to grind the pigment, and also as to the best drier to use. While it is true that the use of the proper pigment helps to protect the oil from decay, it is also true that a chain is only just as strong as its weakest link, so a paint is only just as permanent as the constituent which suffers decomposition and decay permits it to be; there is not in use at the present time a paint vehicle that will permit of a permanent protective painting compound being produced. Linseed oil is not the ideal vehicle, but nothing better as yet has been discovered.

Let us examine the characteristics of linseed oil as a vehicle for preparing the compound under consideration. In the raw state it consists of fatty acids, chiefly oleic acid, waxy matter, and albuminous particles. The chemical and physical behavior of these constituents toward pigmentary matter added to it in the formation of a paint are these: The albuminous matter is insoluble in water, and prevents a too ready oxidation of the fatty matter. The oleic and other fatty kinds combine with pigmentary matter of a basic nature, such as oxides of metal, etc., to form metallic soaps or "paints," but if the pigmentary matter consists of inert bodies, such as basic sulphate, silica, etc., then there is very little combination between the fatty and the pigmentary matter, and as a consequence the "paint" pro-



duced by mixing these inert pigments is a poor one, an article, in fact, that is destitute of body or covering power. The waxy matter prevents the paint drying to a certain extent, and also permits the impenetration of air and water to the paint compound.

Linseed oil which has been frozen or subjected to extreme cold weather for several weeks is not fit to use in painting, as cold congeals the fats of the oil, and when subjected to the heat of the sun they melt and cause a greasy surface and running of the paint.

Raw Linseed Oil that has not been subjected to any refining process takes about three months to dry and harden, when a thin film of it is laid on a porous surface. This process of hardening is solid throughout its depth, whereas oil that has been boiled or heated will not form this solid skin. A dry film will form on its surface in a few days, leaving a mass of fluid oil beneath, but the thin film will imbibe oxygen from the air and pass it into the fluid mass until the latter is oxidized, and thus becomes hard and dry. Now, in the first case, the drying has been brought about by the hardening of the albumen, whereas in the latter case it is brought about by the oxidation of the fatty acids, and the result is, in this case, the production of a resinous mass. In the case of boiled oil, all the good qualities of the oil as a vehicle for compounding with pigments in the production of a paint are destroyed, for these reasons: The heat to which the oil has been subjected eliminates the albuminous matter and oleic acid, and leaves a mass of fatty matters that have little or no affinity for pigment (do not separate or form soap—i. e., paint). With pigmentary matter, the product obtained by boiling linseed oil is a poor quality resinous varnish which is pervious to air and moisture and becomes oxidized into a brittle resinous matter, which is of a non-preservative nature. This brittleness is carried into the paint compound when boiled oil is mixed with pigment and as a result such paint becomes non-adherent, and easily wasted away by rain, wind, etc.

It is especially dangerous to use boiled linseed oil for undercoatings, as it is a surface-dryer and sets on top. This keeps the under surface from drying and causes cracking, while raw linseed oil dries from the bottom.

Let us now consider more in detail the nature, action and function of driers. The true action of these compounds is to saponify a portion of the fatty acids in linseed oil, and thereby render that fluid of a quicker-drying nature. Driers effect this purpose by setting up decomposition in the oil, whereby these driers, which are of a basic nature, unite with the fatty acids to form soaps, and, as a result, expel glycerine—the base to which the fatty oil acids are united. In such cases the glycerine which is eliminated from the oil is absorbed by driers, and thus the hardening and drying of the oil is hastened; because where there is free glycerine in the oil its normal state of drying is retarded, because glycerine largely absorbs moisture from the air or any other source obtainable, and as a consequence prevents the solid-

ification and hardening of the saponified ingredients, and also retards the oxidation of any fatty acids. The quantity of driers used is only sufficient to saponify small portions of the fatty acids. If all the fatty acids were saponified by the drier, there would be none left to unite with the pigmentary matter, and as a consequence there would be no binding property in the oil. Again, by saponifying a portion of the fatty acids, there is less of these acids left to unite with the pigment; but the chief value of the drier is in the elimination of the glycerine. If the fatty acids be not dissociated from the glyceryl, then the oil would not form durable paint when ground up into pigment, because a more or less separation of the glycerine would occur on the union of the pigment with the fatty acids; and as some pigments do not absorb glycerine, there would be a quantity of free glycerine present in the paint, and as a consequence such paint would not be proof against the penetration of water, because the free glycerine would imbibe moisture. The best kind of drier to use in the preparation of a vehicle suitable for producing a durable paint is a salt of manganese (either the sulphate or borate), because these salts form hard, insoluble soaps with the fatty acids, etc., whereas lead driers form soaps which are miscible in water.

We now come to the consideration of the pigments most suited to use in producing durable anti-corrosive paints. Basic pigments are such as neutralize the fatty acids of oils. Oxides of metals—as of lead, iron, manganese, etc.—are basic in character, and therefore readily combine with the fatty acids of oil vehicles. Pigments of a basic nature vary in their affinity for the oil acids; those that are strongly basic, such as brown and red oxide of iron, white lead, blue lead, carbon black in combination with other pigments, form good, durable paint. This is because they completely neutralize the whole of the fatty oil acids, or, in other words, completely saponify these acids. Those pigments, however, which do not completely combine with the oil acids, do not form such durable paints.

LINSEED OIL VERSUS PAINT AS A PRIMER.

Linseed oil is specified for the shop coat on new work by many of our Engineers and Architects and their argument for its use is that it protects the iron from rust and aids the inspector. We claim that while it aids the inspector in his inspection, it has many faults as a primer, as it gathers much dirt and cinders in shop and transportation, and does not protect the metal from rust, as we propose to prove in this article.

Any practical Master Painter will allow that boiled Linseed oil when used alone for the first coat on metal will not dry hard in weeks. It oxidizes on the surface, absorbing moisture and forming a skin, leaving the underneath portion soft, and easily knocked off in shipping, and later on will cause subsequent coats of paint to crack and peel. This is because the first coat of oil must dry some time, and in so doing will force the top coats to crack, and sooner or later come off.

Mr. E. Gerber's examination and report on the Cairo Bridge shows that the approaches, which received one coat of paint in shops, weathered better than the Bridge, which received one coat of oil in shop (see Illinois approach of Cairo Bridge, p. 488, Vol. 33, "Transactions of the Amer. Soc. of C. E.") When the Cumberland Valley R. R. Bridge was built, at Harrisburg, Pa., it was built jointly by the Edgemore and Union Bridge Works, and at one shop they applied one coat of paint. After erection it was found that the oiled part of it was rusting very badly. Two coats of our paint were soon applied on the entire structure and the section that received one coat of paint at shop stood much the best. Mr. R. I. Sloan, late Chief Engineer of the South Side Elevated R. R., Chicago, Ill., specified oil for priming coat. He allowed the Lassig Bridge and Iron Works Company to paint the section that they built at their shops with one coat of our Oxide of Iron paint, and the structure received two coats of our light colored paints. The section built by Lassig, covered with three coats of paint, weathered much the best.

The experiments made by Dr. C. B. Dudley, Chief Chemist P. R. R., show that the worst enemy of paint is water, and this attacks the oil. Linseed oil alone, spread on a surface and dry, is about like a sponge, and absorbs water rapidly ("Transactions of the A. Soc. of C. E.," Vol. 33, pp. 529-530). There is no question that the great *mistake* of the past has been the specifying of oil for the shop coat, and not giving enough attention to having the surface that receives the first coat of paint clean.

INFLUENCE OF PRE-EXISTING RUST ON IRON PAINTS.

Translated from the German of Louis F. Anden.

In directions for using anti-corrosion paints for iron, particular stress is always laid on the fact that the surface to be painted should be free from all patches or even specks of rust; and it is usual to thoroughly clean the surface beforehand either with pumice, steel brushes, or the sand blast, so that the paint may adhere in a proper manner to the clean, bright metal, and to prevent the premature decay or destruction of the paint on subsequent exposure to atmospheric influence. The known fact that no paint will stand long on rusty iron, the rust continuing to extend underneath the former, and finally causing it to peel off, induced the author—in the absence of any existing experiments on the subject—to investigate the actual progress of rusting when once started, and the phenomena accompanying the operation. A number of iron plates, rusted either naturally or by artificial means (but not to such an extent as to produce pitting), were carefully dried, and then coated with a circular patch of oil paint. White paint was chosen as being the most calculated to reveal the expected phenomena, whereas other shade would mask any color change that might be produced. The plates were then laid in a horizontal position, and the paint exposed to the weather for a definite period, so as to allow both sun and rain to act thoroughly. In view of the results detailed below it is important to remember that the plates were perfectly dry before the paint was applied, as otherwise the experiments might have turned out differently.

In one set of tests, circular patches on the rusted plates were coated with three coats of white-lead paint, and left in a horizontal position for two months. In no case did any of the painted patches show penetration by the rust, for, though the original white color was reddened by the flow of rust-laden water over its surface, the removal of this superficial contamination revealed the perfect whiteness of the underlying paint. No further progress of rusting under the paint could be detected. The paint adhered firmly, and could only be removed by force. From these results, it would appear that paint helps to preserve even partly rusted iron in its original conditions, no increase in the formation of rust being discernable.

In another set of tests, three coatings of white zinc oil paint were applied, and the plates exposed for 3 1-3 months. (1) The paint exhibited a merely superficial reddish coloration, extending from the edges towards the centre, and not due to the penetration of rust. (2) The paint set hard, and had to be scraped off with a knife, which at the same time removed a portion of the original rust. (3) There was no question of any penetration of the paint by rust, the two entering into such intimate adhesion as to be only separable by force. (4) The parts of the plate unprotected by the paint were covered with a thick foliaceous incrustation of rust.

The conclusion furnished by these experiments is that, during an exposure lasting from two to three months, no influence on the paint can be traced to any underlying spread of rusting; but what the effect of a longer exposure to the atmosphere cannot be prognosticated. In the author's opinion, oil paint may be safely applied over films of dry rust, though not over pittings or incrustations of rust. In the case of the latter, he has found by experiment that the paint becomes loosened, and the decomposition of rusty iron of this type cannot be arrested by means of paint.

DURABILITY OF STRUCTURAL IRON PAINT.

In the Engineering News, September 10th, 1903, is an article describing the tearing down of a building that was erected about 1850 in New York City for the Bank of the State of New York, and supposed to be the first building erected in the United States with iron girders and joists. This article states that all of the iron work appears to have had two coats of brown oxide paint. The condition of this paint covering, and of the iron work in general, at the time of taking down the building was excellent, and entire girders could be found with no rust spots whatever. In the picture shown in the article, the builders name as painted in white on the brown Oxide paint of the girders 53 years ago, can be plainly read.

The rust forming agency is a solution of oxygen in water. This constitutes the whole secret of the production of rust. Hence, it follows that, other conditions being equal, cold water is more active in producing rust than hot, and iron rusts much more strongly when the contact with water is intermittent than in cases of permanent immersion; moreover, a short rain shower will cause a greater formation of rust than a whole day's complete immersion in water.

Hygroscopic salts and volatile ammonia are also rust producers of the first order.

There has recently been published in several of the trade papers an article in which it was advised to cover iron with hydraulic cement to prevent it from rusting. We would not advocate the use of cement for such a purpose. We have already stated it is the oxygen in the water which causes rust. The cement for a while would take up the oxygen, thus allowing only pure water to reach the iron, and pure water will not cause rust, but after a while the cement reaches its limit as regards the taking up of the oxygen, and from then on ceases to be a protector of the iron. The trouble with this cement experiment, as with many others, is that it was not given a sufficiently long time test.

SUMMING UP.

A review of the previous articles, tests, and experiments suggests the following conclusions:

1st. That the chemist is not usually a paint expert. His mission is to analyse and hunt for adulterants and find if the specified materials are used;

2nd. That the laboratory test is not practical or conclusive, but often deceives us, as it is generally much more severe than are natural conditions.

3rd. That long time weather tests are conclusive, for they meet conditions that are encountered in actual practice.

4th. That the Red and Brown Oxides of Iron when properly selected and roasted are the best pigments for all around weather exposure; but these pigments are often abused by being adulterated with cheap, worthless oils, which have brought them into bad repute, and many common mineral or iron ore pigments which are of no value as paint pigments are mined and ground and used just as they come from the earth. Lead, selected iron oxides and carbon pigments obtain their value, color and durability from the *fire* treatment they receive in making them inert and unchangeable.

5th. Carbon comes next to the Oxides, and under some conditions of exposure is even superior, especially when improved with a mixture of a selected inert filler which will give it body and opaqueness.

6th. For under water or underground work, the asphaltum varnish paints, like National Paint Works No. 500—see page 7—have no equal.

7th. Graphite has not proven to be as desirable a pigment for durability as was expected, and gives best results when used in combination with other selected pigments.

8th. For the first coating we are convinced that a first quality Red or Brown Oxide of Iron is as durable as Red Lead, and that Blue Lead which is manufactured direct from native high grade galena, by sublimation at a temperature of over 2,000 degrees, and which consists chemically of oxy sulphate of lead in intimate molecular contact with carbon black, is the equal of Red Lead and for some purposes superior, because it is impervious to the action of sulphureted hydrogen and all other deleterious gases, and keeps in better suspension.

9th. As vehicles nothing yet has been discovered to equal pure raw linseed oil and turpentine Manganese Driers.

10th. It requires thought, labor and experience along special lines to produce satisfactory metal paints, and that even with a high grade product quantity is as essential as quality; in other words, that new work should receive not less than three coats of paint, while four thin coats are still better. For instance, the Forth Bridge, which has 145 acres of painting surface, had four coats (all oxides) applied on erection.

11th. Another feature essential to the production of a good paint for preserving iron from rust is that the paint should be finely ground. When this is effected every minute particle of pigment will be thoroughly impregnated with oil or varnish, and the whole will form a perfectly homogeneous mass in which no granules or the like will be found. If, however, the pigment, though in ever so fine a state of division, be merely stirred into the vehicle, without grinding, it will remain granular or gritty, so that the granules will be apparent to the naked eye when the paint has been laid on, and these irregularly impregnated particles of pigment are able to absorb moisture and facilitate its admission to the surface of the metal.

SPECIFICATIONS FOR PREPARING AND PAINTING METAL SURFACES.

SHOP WORK.

1. All metal surfaces shall be carefully and thoroughly scraped and cleaned of all rust, mill scale, dirt, grease and dust—either with sand blast or steel scrapers and steel wire brushes; then use a stiff bristle brush for dusting off the surface to be painted. Immediately after cleaning apply one coat of NATIONAL PAINT WORKS, WILLIAMSPORT, PA., Standard Prepared Paint No. ———

All inaccessible and inexposed surface shall receive two coats of the same paint, to be applied before assembling.

ERECTION.

2. After erecting, all rust spots shall be thoroughly cleaned, and all places where the paint is rubbed off, and all edges, rivet nuts and bolt heads shall receive an extra coat of the above paint. After this has had time to thoroughly dry, apply the second coat of NATIONAL PAINT WORKS, Williamsport, Pa., Standard Prepared Paint No. ———

FINISHING.

3. After allowing five days for the paint to dry, then apply one coat of NATIONAL PAINT WORKS, Williamsport, Pa., Standard Prepared Paint No. ——— for first coat, and No. ——— for last coat.

4. No coats shall be applied before the previous coats are thoroughly dry, and only pure raw linseed oil shall be used in thinning (benzine and other cheap oils absolutely prohibited). No paint shall be applied out-of-doors in wet, freezing or misty weather, and all painting, whether in shops or field, shall be done by skilled workmen.

5. All paint shall be bought direct from the manufacturer in original packages and opened on the ground in the presence of the inspector.

Williamsport, Pa., March 1, 1904

To the Engineer and Architect:
Dear Sirs:—

We have taken the liberty to submit the above specification, representing the latest approved method of application of paint for protection of metal surfaces. Should our paints meet your approval kindly specify the same for your work in hand, advising us that you have done so, and we will look after your interests and see that you get just what you specify. We shall be glad to supply you with our full line of colors, or samples in the liquid form, at any time desired.

Yours truly,

NATIONAL PAINT WORKS.

NATIONAL PAINT WORKS.

Standard Prepared Paints.

Prepared Paints ready for use are in conformity with the general advancement of the age. It is merely a repetition of the story we see everywhere around us; manual labor with its drudgery, want of uniformity and want of completeness giving place to the perfection of scientific appliances.

The advantage of having a paint ready for use (excepting the addition of more oil for raw surfaces) is now so well recognized that nothing need be said in its favor. The National Paint Works were not the first manufacturers of mixed paints, but *were the first* to discover the need of a Standard Prepared Paint, made honestly of pure oils and pigments. We have sold more paint in bulk (barrels and carloads) than any other manufacturer of prepared paints in America. We have worked out many hard problems. The covering, drying, finish, flowing, or easy working under the brush, are special features to which we have given much study. Our prepared paints, dipping paints, paste paints, semi-paste paints, formula paints, steel colored paints and fillers are all specialties that we have worked years to PERFECT, and it is our desire and ambition that the National Paint Works shall continue to be known as "THE OLD RELIABLE."

Owing to the modesty of Engineers and R. R. Officials, we have omitted their names from many of the following reports, but will be glad to furnish them when requested to do so.

No. 31. Special.

RED OXIDE OF IRON.

This is our best known paint and it has made a famous reputation for itself, and in use today on more Iron and Steel Structures in the United States than any other paint and has never failed to give perfect satisfaction. We make it for three coat work in three shades (if desired), as follows:

31-Special—Pure English Red Oxide.

31-C—Slate shade, Oxide and 40 per cent. Carbon.

31-D—Brown shade, Oxide and 20 per cent. Carbon.

We have no hesitancy in stating that there is no paint on the market today which will produce the same results (as regards beauty and durability) for so small a cost, and to substantiate this claim we take pleasure in repeating some of the experiences of others with it.

The Louisville & Jeffersonville Bridge across the Ohio, owned largely by the C. C. C. & St. L. R. R. (Big Four), was painted with No. 31 in 1895 and has not required repainting yet, 1904.

The Poughkeepsie Bridge when erected was first painted with No. 31 and it stood seven years before it required repainting, was then repainted with Graphite, and in three years was repainted again. Mr. L. B. Bidwell, formerly Chief Engineer for the N. Y. & N. E. Ry., was a believer in Red lead and had their bridge at Hartford, Conn., painted with it. In two years' time the paint faded and looked very badly. He went to Poughkeepsie and made a personal examination of our paint on the bridge there and abandoned Red Lead and painted all of the bridges on their system with our No. 31.

Kenton Avenue Bridge, Cincinnati, O., built in 1896, painted with three coats of our No. 31, not repainted yet (1904) and hardly any rust spots have appeared.

Sioux City, Iowa—Combination Railroad and Highway Bridge across the Missouri, built in 1895; painted with No. 31, repainted one coat in 1901 and now looks as if good for three years more at least.

Snake River Bridge, Lewiston, Idaho—Highway Bridge built in 1898; used No. 31 for first coating, and finished with a coat of White Lead which we did not furnish. The President of the Bridge Company owning the bridge writes, June, 1903: *"We are well pleased with the first coat of paint, but the White Lead is nearly worn off."* He orders it repainted with No. 31D, which was done in the fall of 1903, and after the painting was finished he writes: *"It is perfectly satisfactory, and the Painters state it is the smoothest paint they ever used."*

Polk and Dearborn Street Station, Chicago—The steel work was painted in 1900 with 31, D. The Master Carpenter reported in 1903: *"The paint is doing finely."* Six different roads use this station, with a large number of trains daily, causing a large accumulation of sulphurous smoke,

No. 31
SPECIAL

No. 31—C

which is one of the most deadly enemies to paint, and yet after four years' wear No. 31 is making another record for itself under exposure different from the others mentioned.

Drainage Canal Bridges, Chicago—Since 1898 we have been furnishing No. 31 in all shades for nine of these bridges, among them being State St., Ashland Ave. and Western Ave. One of these bridges was repaired this year, and the inspector reported less than 1 per cent. of rust. The record of No. 31 on these bridges is in strong contrast to the record of Red Lead, which was used on many of them in the heavy formula of 33 pounds to one gallon oil, mixed on the ground.

Cleveland, Lorain & Wheeling R. R. repainted in 1899 with No. 31 two long viaducts at Flushing, O. They had been painted eight years before with it. No. 31 was also used on many of their other bridges.

St. Louis Merchants' Bridge was painted with it except one section, which was painted with Red Lead, and after four years' exposure it was found that the Red Lead was scaled and pitted and needed repainting much more than our No. 31 (Amer. Soc. of C. E., Vol. 38, page 560).

Mr. O. F. Nichols, who was Engineer of Construction of the Suburban Elevated R. R. when built, used our No. 31 on all work over the New Haven R. R. tracks (Amer. Soc. of C. E., Vol. 38, pp. 547-548). He examined the paint and after two years of exposure he said that our paint had made a good showing, and that he believed it to be the best Oxide of Iron paint made. While he was on record as a Red Lead advocate, from his experience with each, if he was doing work for himself, taking cost, covering capacity and durability into consideration, that he would give No. 31 the preference. The West Shore R. R. Co. used this paint for years on all their bridges with great satisfaction. Mr. H. K. Nichols, late Chief Engineer of the P. & R. Ry., specified No. 31 for their bridges, and their long bridge over the Susquehanna at Sunbury, built in 1885, has been painted three times with it, and is now in good condition.

P. R. R. Viaduct, entering City of Philadelphia, main line, painted with No. 31 in 1902.

It is the standard paint for about 40 per cent. of the Gas Companies of the United States, the balance of the 65 per cent. that we sell using either our No. 17-21 or 32.

The Pennsylvania Steel Co. use it largely as their standard Shop Paint.

In Architecture the above paints were used on all the Metal in the Savoy Hotel, New Olympia Theatre, American Surety Building in New York, and the Wellington Building, Boston. Also on the metal of five of the largest buildings at the World's Columbian Exposition, Chicago, and the Pan-American at Buffalo, N. Y. We can name hundreds of structures decorated and preserved by this paint, and it is with pride we mention its record.



No. 31—D

No. 17. Special.

BROWN OXIDE OF IRON PAINT.

Many enemies of "Oxide of Iron Pigments" claim and publish that Oxide of Iron is in itself only Iron Rust. They are in properties entirely dissimilar. Oxide of Iron, which undergoes no chemical change in centuries of exposure, makes it the most durable pigment known.

Iron Rust is Hydrated Oxide of Iron. It is never used as a Paint Pigment upon iron or steel by those manufacturers who have made a study of their business, while upon wood its use is unobjectionable. If the reader wishes to make an experiment, all he has to do is to put some Iron Rust in an iron spoon and put it in the fire until it gets red hot, then take it out and he will see the change in color; it has also taken up one more part of Oxygen, which makes it Oxide of Iron. No further change can take place in this by exposure to the air or moisture, which makes it the most durable color. For the above reason Mr. G. H. Thomson's (M. Am. Soc. C. E.) theory of removing rust with fire is the most scientific (American Soc. C. E., Vol. 38, pp. 541-542). It is without question the best method known for preparing metal to receive paint, as absolutely clean metal in pure water and pure air will never corrode. Those in want of a brown paint will obtain satisfaction from our No. 17, as shown on the above sample. This color and paint we prepared especially for Mr. Chas. Kellogg, of the old firm of Kellogg & Maurice, Athens, Pa. Mr. Kellogg wished something different in color and high in quality, to distinguish their work and make a record for the quality of the paint they used. We made a combination of different Oxides of Iron that produced the above color and the most satisfactory results, as the following correspondence proves:

Mr. Chas. I. Brown, late Chief Engineer of St. Louis and San Francisco Railway, St. Louis, Mo., under date of February 22, 1895, writes to Mr. Chas. MacDonald, President Union Bridge Company (successors of Kellogg & Maurice), No. 1 Broadway, New York, as follows:

"We have been repainting a number of our iron bridges during the past year, and found that the paint you put on the Arkansas River Bridge, at Tulsa, was the best on any of the bridges. This bridge was built in 1885, and the paint held in good shape until repainted last summer.

It showed some time ago that it needed painting, but it was allowed to stand nine years, and was still in fairly good condition. I have nothing to show what kind of paint this was, and I write to inquire whether you have any record of it. Any information you can give me without going to too much trouble will be thankfully received."

Mr. MacDonald's reply, under date of March 4, 1895, was as follows: "According to the records on our books, the paint used on Tulsa Bridge was No. 17 from National Paint Works, Williamsport, Pa."

This No. 17 is a favorite color with the Gas Companies and next to our No. 31 is our best seller to them. It is just as durable as No. 31, but not as handsome.

Knowledge and experience have taught us how to combine different materials that will produce results like the above. The dry pigments we use are very finely ground dry and then reground in oil, and then mixed in oil. This extra grinding adds largely to the covering capacity and durability.

Its beautiful dark brown color and low price for a pure linseed oil paint makes it a very desirable paint for country and city bridges, and general contract work.



No. 17
SPECIAL

No. 16. Special.

CARBON-ASPHALT BLACK.

This paint is composed mainly of Carbon and Asphaltum combined with pure linseed oil and our special Drier, and our guarantee is on every barrel *"that these are the only liquids we use in it."*

This is the oldest and most successful Combination Carbon Black paint on the market, and we are always ready to have it tested against any other so-called similar paint at even twice its price. We have kept this paint as we do our others at a moderate price, not trying to mystify the buyer by giving our goods fancy names, but simply designating them by number and telling frankly what they are made of.

No. 16 has a good body, works smoothly under the brush, and dries jet black with a bright lustre. The fault with most carbon and graphite paints is that they are very light in weight and cover with so thin a film that they do not protect very long.

In addition to its being an ideal paint for Bridges, we especially recommend it as an economical and durable paint for use on Steel Cars. A prominent railroad painted one of their cars with this paint in 1901, and we have lately received the following letter from them:

"Dec. 21, 1903.

"Our Master Painter has just examined Car No. 10382 and finds the paint to be in first-class condition and he recommends it as a good honest carbon black, suitable for all kinds of structural steel and iron painting."

It was recently used on a 2,500 foot bridge in Iowa by virtue of its record for many years on the N. Y. C. R. R. The Lehigh Valley R. R. have painted many of their largest bridges with it. Seaboard Air Line use it now and have for many years past as their Standard Paint. It is also the Standard Bridge Paint for the Norfolk & Western R. R. and Bessemer & Lake Erie. The Guayaquil & Quito R. R. have painted their bridges with it, and it is weathering well there after two years of exposure to that trying climate. The American Bridge Co., and the Companies comprised in it, have used hundreds of barrels of No. 16.

It is also used on Gas Holders and gives excellent satisfaction there, although we think on the score of beauty either our No. 31, 17 or 15 will give better satisfaction, as we are not in favor of putting *black* on Gas *Light* Holders.

A large structural Iron concern in the West which makes a specialty of painting its stock beams on arrival has used No. 16 for four years. A trial was made with the paint in connection with other recommended paints and after fifteen months' exposure to the weather and the rough-and-tumble work of the open yards our paint was found to stand the best, and was adopted as their standard.

No. 500. Metal Protector.

Made in Two Colors—Black and Green.

There is a high gloss paint, anti-metallic, anti-electric, non-porous. Asphaltum and Copal gums form the pigments.

On account of its Varnish character it should only be used during the hot summer months in our Northern climate. It has made an excellent record in hot Southern countries, where it can be used to better advantage, as its record on bridges of the Chihuahua & Pacific R. R. in Mexico shows. The Chief Engineer in September, 1902, writes: *"In regard to the green paint you sold us some three years ago, I would say, that it has given very good satisfaction on our bridges."*

On account of the color being a jet black of bright lustre it is especially adapted for Bridge Railings. Some of the large Bridges in the middle and far West have their hand railings coated with it.

For hydraulic, electric or underground construction it is an ideal paint. It was used with good success on the underground and under-water iron work of the new Williamsburg Bridge.

No. 500 produces best results when used over a coat of our No. 700, Red Lead and Graphite Paint. See report of tests on page 8.

No. 400. Pure Carbon Paint.

Ready Mixed or Semi-Paste Form.

This Carbon paint, which is similar in composition to several other good carbon paints now prominent on the market for the painting of Steel work, is made of selected materials, the purest and best obtainable and is the equal in durability (the prime object to be obtained) of any Carbon paint manufactured. It is lower in price than many of the much advertised Carbon paints, and for this reason, together with its wearing record, the railroads are very willing to give No. 400 a trial, and some already have used large quantities of it in painting new and old bridges.

No. 400 is in use on the bridges of the following railroads:

Lake Shore & Michigan Southern Ry.

Chicago Great Western Ry.

Chicago, Milwaukee & St. Paul Ry.

Cleveland, Cincinnati & Louisville R. R.

On one of these roads several bridges directly in the heart of Chicago, where they are subjected to extremely severe conditions, were repainted in 1899 with No. 400, and an official in a letter says: *"They have not been painted since they were coated with your Carbon Paint No. 400. I do not*

think we shall have to do anything with them in 1903," which shows that the paint, already four years on the work, is here making a good record for itself in this trying position.

The Engineer of another road, in a letter Dec. 26, 1903, writes: "*We painted our old bridges at with your No. 400 and our painter reports that it is wearing satisfactorily.*" The paint for this bridge was shipped in March, 1901, so that almost three years' very satisfactory wear has been already obtained. The bridge referred to is one of several spans across one of our large Western rivers.

The Purchasing Agent of another road writes us June, 1903: "*Our President was very much pleased with your paint (No. 400) when we went to ——— and saw the steel bridge there and we are going to give you a show.*" "*I have used it (No. 400) on different structures and find it all right,*" is what the Bridge Inspector for one of the other railroads says in May, 1902. This railroad used No. 400 on all its new bridges in 1903 as well as in 1902.

The Engineer and Superintendent of a Gas Company in one of our large cities, which ordered some of the No. 400, as the result of a test with several paints, states:

"*I had a sample from you about a year ago for trial; it stood the test. The paint mentioned was subjected to the action of sulphur or sulphuric acid fumes arising from the steam and vapor from the quenching of the red hot coke in the cellar of retort house. This action was going on night and day during the test of twelve months, and the girders painted with two coats of your paint, appear not to be affected by the action of the acids, so far.*"

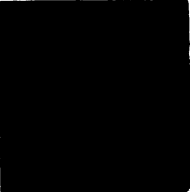
Any paint which will stand a test of this kind is pretty sure to show up well on bridges and other kinds of steel work.

No. 400 in the black color is a strong jet black, and when applied furnishes a brilliant lustre which keeps bright for a long time. Its consistency is not so heavy as our other Carbon paint No. 16, which make it of the two the better for priming coat. In this respect it is ideal. Some of the railroads prefer to use it as a priming coat under one or two coats of No. 16. On account of its light density No. 400 has extra large covering power, but having an excellent body it furnishes a good thick coat, which is necessary to long wear.

A group of Carbon paints were recently tested by a large consumer on electric trolley poles of the standard iron size and our No. 400 covered fourteen poles to the gallon, being two to six poles in excess of any of the others. Trial of this paint will prove our assertions, viz.: That No. 400 is pure Carbon, that it is elastic and far-reaching and imparts to the surface a beautiful gloss.

We make it in three colors: No. 400 Carbon Black, No. 400 B-Dark Brown, No. 400 M-Medium Brown, so that a different color can be obtained, if desired, for each coat, as is now quite the common practice among engineers in painting important work.

No. 400 is usually made in liquid form, ready for use, but is also made in Semi-Paste form, requiring one gallon linseed oil to one gallon semi-paste.

No. 32.**GRAPHITE.**


We are believers in having the purest and best. This applies to our Graphite Paints, as well as to our other products. We claim for No. 32 a larger percentage of Carbon than any other Graphite paint on the market, and it has made its reputation for durability by actual results. We do not charge a fancy price for it, and there is no reason why a Graphite paint should cost more than a first-class black paint like our No. 16 Special, and as a matter of fact graphite pigment to-day costs 40 per cent. less per pound than the pigments we use in our black paints.

**No. 32.
Natural
Color.**

If you specify National Paint Works' No. 32 its moderate cost will induce the use of it, while if other makes of Graphite are specified their high cost (due to extravagant advertising and selling expenses) will often cause worthless substitutes to be used.

In a western city a large city bridge over the main line tracks of a railroad was painted two coats with No. 32, in July, 1898, and is still in good condition--1904.

We have many letters on file at our Williamsport, New York and Chicago offices from railroads and gas companies (who do not care to be quoted in print) testifying to the good qualities of No. 32.

It is manufactured in both liquid and paste form in four shades.

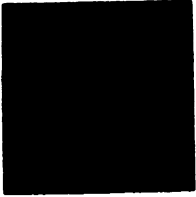
No. 32—Natural Color.

No. 32-E—Dark Brown.

No. 32-F—Medium Brown.

No. 32-G—Dark Green.

We always recommend buying it (this will also apply to all our paints) in ready mixed form, because you can get better wear and covering capacity, as we can grind a larger amount of pigment into the oil by machinery than can be done by hand mixing.



**No. 32 G
Dark Green.**

No. 300.**PURE RED LEAD.**

This is the purest ready-mixed Red Lead paint offered for use on Steel Work. It has many advantages over the use of Dry Red Lead mixed with oil on the ground as wanted. Let us enumerate some of them:

It does not settle hard in the pot or barrel.

It is easily stirred up.

Less time is consumed in the handling of it.

Painters will do better and more work. They prefer to use it.

There is no running or streaking on slanting surfaces.

Its covering capacity is better.

After the paint is on, the surface looks as smooth and uniform as if painted with a first-class Carbon, Graphite or Iron Oxide paint.

Greater durability is obtained.

For specification and contract work it is far superior to any other.

In confirmation of some of these statements we cite the experience of a few of our customers:

The Chief Engineer of a railroad in a letter about No. 300, says:

"The paint spread very freely and gave good satisfaction. The Red Lead was held in suspension very well and required but little stirring up."

The shipment of this paint was made April 14th, and was not used till July, as the letter further stated, full three months afterwards.

A Bridge Company which has used considerable of the paint, says:

"It works fine under the brush and the work looks all right after it is applied. It does not run on slanting surfaces and the rain does not wash it off, while it is green, with which defect we have had an experience recently. Taken upon the whole we find it to be a first-class paint, the best red lead paint we have ever had."

A large western city which paints most of its bridges with Red Lead, using it in the natural color for the finishing coat, tried No. 300 on several new bridges. The City Bridge Engineer informed us that he believes they will get much greater durability than with Red Lead used in the old way, and it was for this reason they asked the Bridge Company to use it. The first bridge painted with No. 300 made such a handsome appearance when the painting was done they requested (as their rules and regulations forbid them specifying anybody's paint) the bridge companies to use it on other bridges. Recognizing the advantages already mentioned, they very gladly did so.

An analysis made by a chemist states: "Qualitative tests upon the oil extracted by ether showed it to be boiled oil. The sample submitted is apparently an unadulterated red lead mixed with boiled linseed oil."

It has been found in the experience of Engineers, Architects and Inspectors, even after the greatest care has been exercised, that in specification contract work unsatisfactory results are obtained more often with Red Lead than with any other kind of paint. One of the most noted Bridge Engineers in the country informed us a short time ago that while he believed in the durability of red lead, he had given up specifying it because almost all of his red lead jobs turned out poorly.

Red Lead mixed on the ground is the most expensive paint to put on, especially with the heavy formulas advocated by some of the makers of lead, who give as a reason for such advocacy, "that it is for the purpose of increasing the durability and to prevent running and streaking," while the real reason lies in their desire to sell as much dry lead as possible. A contractor who has the paint prescribed in this way, realizing its high cost, looks around to see where he can save in the paint; and no

matter how good eyes the inspector may have, there are always ways in which it can be done. A handful of dry lead taken from a formula means a saving of five to six cents on every gallon of paint. Several of them mean a larger saving. As an example of this we recall a case which came under our observation in Chicago, where unknown to the Engineer and Inspector almost a ton of dry Red Lead was saved on the job.

If No. 300 has been specified this would be prevented, as the inclination is to use the paint just as it comes from the factory without any tinkering.

No. 300 is not made with a heavy formula of Red Lead. The experience around Chicago, during five years past, where specifications on a large amount of bridge work called for 33 pounds of red lead to the gallon of oil, has proven the mistakes of using so much lead. Most of the bridges were in bad condition after three years, the paint scaling off, and the color, which was originally a medium brown by the addition of lamp-black, has faded to a dirty gray. Several of the bridges were re-painted inside of four years, but not with Red Lead again.

A ready-mixed Red Lead paint with 95 per cent. pure Red Lead as our No. 300 is, will not stay up in suspension equal to a Carbon, Graphite or Iron Oxide paint. However, our experience with No. 300 justifies us in guaranteeing its good suspension and its easy stirring up, for sixty days. If found otherwise, it can be returned.

We recommend No. 300 most strongly for field work where the painting will go on without interruption. The paint should be ordered in small quantities as needed, so as to insure its being new and fresh. On account of its extreme weight we always ship it in half barrels.

No. 250. Blue Lead.

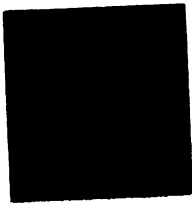
For some work Blue Lead seems to be the superior of Red Lead. It has been on the market for twelve years and the use for it is increasing.

Red Lead has a great affinity for Carbonic and Sulphurous Acid Gases, while Blue Lead, it is claimed, is impervious to these and other gases, so that for train sheds and gas holders it would seem to be a better pigment for first coating than Red Lead. It does not settle or cake like Red Lead and is finer ground and covers more surface to the gallon.

We furnish it in its Natural Pure state, or in any combination desired.



No. 300
PURE RED LEAD



No. 250
BLUE LEAD

COMBINATION PAINTS.

Red Lead.

Red Lead has been acknowledged by railroads, bridge engineers and others for many years, when properly used, as one of the most durable pigments for paints which could be applied to steel and iron.

Bad results from the use of Red Lead alone have usually occurred by reason of its peculiarities, which are common to this pigment and to no other, and lack of skill in applying the paint. Its settling and consequent waste—fading, small covering capacity, difficulty in brushing out, running on slanting surfaces, high cost both for the paint and the labor of putting it on—are objections which all users of the paint are familiar with.

In our Combination Paints all these disadvantages are removed and its virtues are retained, including durability.

These Combination Paints stay up in perfect suspension, have great body, large spreading capacity, work easy under the brush, and the pigments do not separate. Only pure raw linseed oil and best turpentine driers are used. The combinations have only the pigments mentioned, which can be substantiated by chemical analysis, if desired.

Best engineering practice to-day requires in the painting of bridges that two or more coats of a contrasting color shall be used. This makes it easy to inspect the work and observe if the material is well covered with each coat. These Red Lead paints are well adapted for such work, since they have nearly the same pigments in each case, only different proportions, and were largely introduced to meet this want.

All bridge painters dislike to use a straight Red Lead paint mixed by hand, and are glad to welcome our Combination Paints.

With new and modern machinery and methods, we are enabled to combine Red Lead with other pigments, for painting steel and iron, so successfully as to make us the leading manufacturers of Red Lead paints in the country.

No. 700.

RED LEAD AND GRAPHITE.

It has been demonstrated by chemical and physical tests, including a long time exposure to the weather, that Graphite has many characteristics which make it an excellent paint pigment when mixed in combination with a selected pigment for steel and iron. Combining Red Lead with it, as we do by special process, makes our No. 700 an ideal paint for bridges and various kinds of structural steel and iron.

We use the purest and best Graphite for our No. 700, as well as for our other paints. This Graphite runs from 75 to 85 per cent. pure carbon,

which is far in excess of any other Graphite used in paints by many other manufacturers.

We call your attention to the report from the Niagara Falls Power Co. on page 8, which proves that No. 700 is the paint for constant exposure to sulphur water, etc.

No. 700.

A large western railroad, formerly using Red Lead, tried No. 700 on a bridge in 1899. The road painter, in December, 1903, reports: "*I examined this bridge this summer and found the paint in fair condition.*" HERE IS FOUR YEARS WEAR ALREADY. This road would have continued to use this paint which is a dark chocolate color, had it not been decided to change its standard color to black. Another painter on this railroad who tried a sample gallon in 1898 reported to the Chief Engineer as a preliminary about the working quality of the paint:

"It is better than either Red Lead or Graphite used separately. It spreads very easily and covers better than any paint I ever used on iron work before. This paint does not settle to the bottom as does Red Lead."

The Division Engineer of another large railroad has this also to say about No. 700: "*We find it to work well under the brush and gives a very good body.*"

One of the largest engineering firms in the United States who are connected with the Westinghouse interests specify No. 700 on their work all over the world, and we are now making shipments to several foreign countries of No. 700 for electrical power plants.

No. 800.

RED LEAD AND RED OXIDE OF IRON.

We use a specially selected Red Oxide of Iron in this paint with the Red Lead—the same Red Oxide which by itself has made a wonderful record for durability in our No. 31 paint.

No. 800 keeps up well in suspension like No. 700. We recently saw a half barrel of it which had not been touched for almost a year, and it stirred up as easily as if only a month old.

It is in growing demand as a first coat paint and is being tried by some of the railroads to take the place of straight red lead. Good reports have already been made as to suspension in the barrel and under the brush.

In respect to durability, No. 800 is making a first-class record. The paint was specified and used on bridges in Columbia, Ohio. An examination during the summer of 1903, of one built in 1898, showed the paint to be in excellent condition with scarcely a break in it of any kind, and the color, instead of fading, as is characteristic of paints having a large proportion of red lead in them as this has, was of a dark, rich red even on the sunny side of the bridge.

BUILDING AND BRIDGE PAINT.

Our Light Colored Paints for buildings and bridges are made of the best and purest pigments, with the necessary coloring to make the shade desired, ground in and thinned, with only pure linseed oil and the best turpentine driers. Our No. 24, shown on this page, has been used by the New York, New Haven and Hartford Railroad on their bridges for the past eighteen years with entire satisfaction. We have supplied a Special Bridge Paint to the Maine Central Railroad for many years. Our No. 3 is used by the Boston Bridge Department on all its bridges.

With reference to New York City work we are now supplying for the iron work of the Subway and for the Manhattan Valley Viaduct Extension our Rapid Transit Black and Rapid Transit Green, and many thousand gallons of our East River Bridge color has been used on the new Williamsburg Bridge.

We supplied the paint for the McComb Dam Bridge, and the Park Department of other large cities use our paint as their standards.

The large shops of the American Car & Foundry Co. at Berwick, Pa., and Detroit, Mich., the shops of the National Malleable Castings Co., at Sharon, Pa., Westinghouse Machine Shops at East Pittsburg, are among those that have been recently painted with our No. 47 Inside White and our No. 76 Outside White, and over twenty of the largest Ocean Steamship Lines in New York, Boston and Philadelphia are using our National Marine Paints for inside and outside work on all their vessels.

The Standard Oil Co. for many years bought their oil tank paints from us, they are now making their own and we know are not getting as good results.

Other shades that we make have been used by nearly every Elevated Railroad built in this country, and on nearly all of the large bridges and viaducts, which are too numerous to mention. They are also used by many of the leading railroads for their buildings and bridges—notably the Lake Shore and Michigan Southern on its entire system; Lake Erie and Western, and Southern R. R. Many engineers prefer a light-colored paint for bridges, as it is a quick detector of rust. Our color card will be sent on request, or we will make any shade or tint desired, to order.

No. 24.



No. 750.

SMOKE STACK BLACK.

We have a very desirable article for painting stacks which is giving splendid satisfaction at a moderate cost.

SUGGESTIONS.

Too much of anything is not so good as just enough. For instance, White Lead is improved and made much better and more durable by adding a proper proportion of zinc. Oxide of iron can be reduced in amount of sesqui oxide and the paint improved and cost reduced. Dr. C. B. Dudley reduced the amount of sesqui oxide in P. R. R. Standard specifications from 50 to 25 per cent., and increased the amount of opaque material the same. His tests show that Sulphate of Lime (gypsum) wears much better than many of the old standard pigments. Numerous engineers think that the oxides of iron that run from 80 to 95 per cent. of iron are the best. This is not a fact. We have secured better results by reducing the oxide, and the best pigments do not contain over 30 to 50 per cent. of iron, as steel is more valuable than iron, and is made so by scientific handling, the same can be said of scientifically prepared paints—they are in keeping with the advanced age in which we live.

As steel is more valuable than iron, and is made so by scientific handling, the same can be said of scientifically prepared paints—they are in keeping with the advanced age in which we live.

Among the prominent engineers who have specified our products, we take pleasure in mentioning Messrs. Asserson, Bonzano, Brown, Buck, Cheney, Clark, Cooper, Curtis, Ernest, Francis, Katte, Hughes, MacDonald, Monocal, Nichols, O'Rourke, Peary, Powell, Quinn, Thompson, Randolph, Suter, Waddell, Zinn. Their records will show that our paints have given satisfactory results, and that we have earned their approval by furnishing honest material and living strictly up to the specifications and requirements.

The old National Paint Works has a reputation all over the country and especially among the Bridge and Structural Iron Companies of furnishing the best goods at the lowest prices, and as a leading manufacturer recently said: "Whenever we see the National Paint Works' paints in our specifications we feel that we are in the hands of our friends and we need go no further to look up prices," to which we add another remark recently made in the purchasing agent's office of the largest bridge company in the world: "The National Paint Works never held us up on prices because their goods were specified." With this feeling prevailing in nearly all these shops (and there is hardly one into which our paints have not gone) the Engineer, Architect and Inspector is sure of having our paints used as a rule just as they come from our factory.

Permanent and durable paint protection depends upon having the metal in proper condition to receive the paint, therefore we make the following suggestions: First, for new work, clean the metal of iron scale as soon as possible after it leaves the rolls, then inspect it and give it one coat of paint; after erection give it at least two coats of paint. Second, in repainting old structures they should be scraped and all rusty places soaked with benzine; then apply the torch and burn out all the benzine. This will change the yellow (hydrated) oxide of iron to the red (anhydrous)

oxide. Third, never paint in wet or freezing weather. In the foregoing pages we have given results where our paint has weathered from four to ten years, under various conditions and climate. If the Engineer or Architect when specifying our paints will follow the above rule in preparing his metal, we can give him 50 per cent. better results in the future than he has had in the past.

HOW TO ESTIMATE THE QUANTITY OF PAINT REQUIRED.

It is estimated that one ton of structural iron of average weight is equal to 150 square feet, and as the covering properties of a paint vary considerably we show below some results that have been obtained by actual use.

The extreme purity of our pigments and vehicles together with the double grinding increases largely the covering capacity of all our paints, and you can figure safely on their covering at least 10 per cent. more surface than other paints, and in many cases we have run as high as 30 per cent. more covering capacity, thus decreasing the cost very much.

No. 16 Special Carbon Black is reported by the Pittsburgh and Lake Erie R. R. to cover on steel cars 702 square feet per gallon, one coat, used in cold weather. On bridge work it will cover about three tons per gallon, one coat, and one and three-quarter tons per gallon, two coats.

Our No. 32 Graphite and No. 400 Pure Carbon Black will cover about 10 per cent. more than No. 16.

Nos. 17, 31, 500, 700, 800 will cover about 2 1-4 tons per gallon, one coat, 1 1-4 tons per gallon, two coats.

No. 300 Red Lead 1 3-4 tons per gallon, one coat, and No. 250 Blue Lead about 2 1-4 tons per gallon, one coat.

If used for first coating the paint unless specially ordered for first coating (in which case it is prepared by us ready for use) should be thinned with raw linseed oil and a little turpentine, but for second and further coats it should be used as received from us, and well rubbed out under the brush, because if it is not well brushed it will lack firm adherence, as a layer of air exists on all surfaces and a good rubbing out eliminates this.

This guarantee appears on all barrel packages of the paints mentioned in this Review:

WE GUARANTEE the liquid portion of this Paint to consist of nothing but pure linseed oil and turpentine dryer. The pigments are selected as the best for metal surfaces after tests covering over twenty-five years.

NATIONAL PAINT WORKS
Chicago Williamsport, Pa. New York

OUR SPECIALTIES.

LIQUID FORM.

Put up in one-gallon tin cans packed 12 in a case.

Five gallon wood kits, 10, 15 and 20 gallon kegs, 25 to 35 gallon half barrels, 50 to 60 gallon barrels.

PASTE FORM.

Put up in 25-pound tins packed 150 pounds in a case.

100-pound kegs, 250 to 500-pound half barrels, 700 to 1,000-pound barrels.

Standard Prepared Paints (Special Color Card)—

For Bridges, Structural Work, Steel Cars, R. R. Stations and Building. In all colors mixed ready for use.

Standard Formula Paints—

Made as per formula desired, or furnished.

National Marine Paints—

We supply over twenty of the leading steamship lines in New York, Philadelphia, and Boston. Any shade desired to order.

Perfection Semi-Paste Paints—

That will stand one, two, three or four gallons of oil thinning.

Paste Form and Specification Paste Paints—

Consisting of 25 per cent. Oil, 75 per cent. Pigment, or as per specifications furnished.

Standard Dipping Paints—

For tin shingles and small hardware, where Metallic Pigment is required.

Standard Gas-Holder Paints (Special Color Card)—

Used by over 65 per cent. of the Gas Companies in the United States as their standard.

Standard Pole Paints (Special Color Card)—

For painting Telephone, Trolley and Electric Light Poles.

Standard Iron Fillers and Steel Colored Paints (Special Color Card)—

For filling castings and for finishing coats on machinery, pumps, etc.

